CLAIMS

1. An antenna structure comprising:

at least one ground plane,

at least a first and a second radiator located at a distance from the ground plane and grounded by a ground point to the ground plane, both radiators being configured to provide at least one resonance frequency in order to provide at least one frequency band, and an isolating layer between the ground plane and the radiators,

separate feed points for the at least two radiators,

in which antenna structure

at least the first radiator is configured to provide at least two frequency bands, at least one of the frequency bands being at least partly overlapping with at least one frequency band provided by the second radiator, and

at least the first radiator is a groove plane antenna such that coupling of the radiators with each other at least within the partly overlapping frequency range is substantially avoided.

2. An antenna structure as claimed in claim 1, wherein

isolation between the radiators at least within the partly overlapping frequency range is substantially more than 10 dB, preferably more than 20 dB.

3. An antenna structure as claimed in claim 1, wherein

polarizations between the radiators are substantially orthogonal such that the diversity ratio between the radiators at least within the partly overlapping frequency range is substantially almost zero.

4. An antenna structure as claimed in claim 1, wherein

the first radiator is configured to provide at least three frequency bands, comprising at least one lower frequency band and at least two higher frequency bands.

5. An antenna structure as claimed in claim 1, wherein

at least one higher frequency band of the first radiator is configured to at least partly overlap with at least one frequency band provided by the second radiator.

6. A radio device comprising an antenna structure for delivering a radio-frequency signal, the antenna structure comprising at least one ground plane,

at least a first and a second radiator located at a distance from the ground plane and grounded by a ground point to the ground plane, both radiators being configured to provide at least one resonance frequency in order to provide at least one frequency band, and an isolating layer between the ground plane and the radiators,

separate feed points for the at least two radiators,

in which antenna structure

at least the first radiator is configured to provide at least two frequency bands, at least one of the frequency bands being at least partly overlapping with at least one frequency band provided by the second radiator, and

at least the first radiator is a groove plane antenna such that coupling of the radiators with each other at least within the partly overlapping frequency range is substantially avoided, and

simultaneous transmission and reception of radio-frequency signals taking place at least within the partly overlapping frequency range are differentiated between the first and the second radiator.

7. A radio device as claimed in claim 6, wherein

the radio-frequency signals being simultaneously transmitted and received at least within the partly overlapping frequency range are configured to be filtered by a band-pass filter, a high-pass filter or a low-pass filter.

8. A radio device as claimed in claim 6, wherein

the first radiator is configured to transmit and receive a time-divisional radio-frequency signal, such as a GSM signal, and to receive a frequency-divisional radio-frequency signal, such as a WCDMA signal, and

the second radiator is configured to transmit a frequency-divisional radio-frequency signal, such as a WCDMA signal.

9. A radio device as claimed in claim 6, wherein

the first radiator is configured to transmit and receive a time-divisional radio-frequency signal, such as a GSM signal, and transmit a frequency-divisional radio-frequency signal, such as a WCDMA signal, and

the second radiator is configured to receive a frequency-divisional radio-frequency signal, such as a WCDMA signal.

10. A radio device as claimed in claim 8, wherein

also the second radiator is configured to transmit and receive a time-divisional radio-frequency signal, such as a GSM signal.

11. A radio device as claimed in claim 9, wherein

also the second radiator is configured to transmit and receive a time-divisional radio-frequency signal, such as a GSM signal.

12. A radio device as claimed in claim 6, wherein

the radio device comprises coupling means for coupling the transmission and reception of the time-divisional radio-frequency signal and the frequency-divisional radio-frequency signal.

13. A radio device as claimed in claim 6, wherein

polarizations between the radiators are substantially orthogonal such that the diversity ratio between the radiators at least within the partly overlapping frequency range is substantially almost zero.

14. A radio device comprising an antenna structure for delivering a radio-frequency signal, the antenna structure comprising at least one ground plane,

at least a first and a second radiator located at a distance from the ground plane and grounded by a ground point to the ground plane, both radiators being configured to provide at least one resonance frequency in order to provide at least one frequency band, and an isolating layer between the ground plane and the radiators,

separate feed points for the at least two radiators,

in which antenna structure

at least the first radiator is configured to provide at least two frequency bands, at least one of the frequency bands being at least partly overlapping with at least one frequency band provided by the second radiator, and

at least the first radiator is a groove plane antenna such that coupling of the radiators with each other at least within the partly overlapping frequency range is substantially avoided, and

simultaneous reception of radio-frequency signals taking place at least within the partly overlapping frequency range is configured to be carried out as diversity reception by means of the first and the second radiator.

15. A radio device as claimed in claim 14, wherein

polarizations between the radiators are substantially orthogonal such that the diversity ratio between the radiators at least within the partly overlapping frequency range is substantially almost zero.

16. A radio device as claimed in claim 6, wherein

the radio device is a mobile station wherein at least one of the following is configured to be the system supported by the mobile station and the

frequency bands of the radiators: EGSM 900 (880 to 960 MHz), GSM 1800 (1710 to 1880 MHz), GSM 1900 (1850 to 1990 MHz), WCDMA 2000 (1920 to 2170 MHz), US-GSM 850 (824 to 894 MHz), US-WCDMA 1900 (1850 to 1990 MHz) and US-WCDMA 1700/2100 (Tx 1710 to 1770 MHz, Rx 2110 to 2170 MHz).

17. A radio device as claimed in claim 14, wherein

the radio device is a mobile station wherein at least one of the following is configured to be the system supported by the mobile station and the frequency bands of the radiators: EGSM 900 (880 to 960 MHz), GSM 1800 (1710 to 1880 MHz), GSM 1900 (1850 to 1990 MHz), WCDMA 2000 (1920 to 2170 MHz), US-GSM 850 (824 to 894 MHz), US-WCDMA 1900 (1850 to 1990 MHz) and US-WCDMA 1700/2100 (Tx 1710 to 1770 MHz, Rx 2110 to 2170 MHz).